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(54) **Title:** TECHNIQUE FOR IMPLEMENTING ADVANCED VOICE SERVICES USING AN UNSTRUCTURED SUPPLEMENTARY SERVICE DATA (USSD) INTERFACE
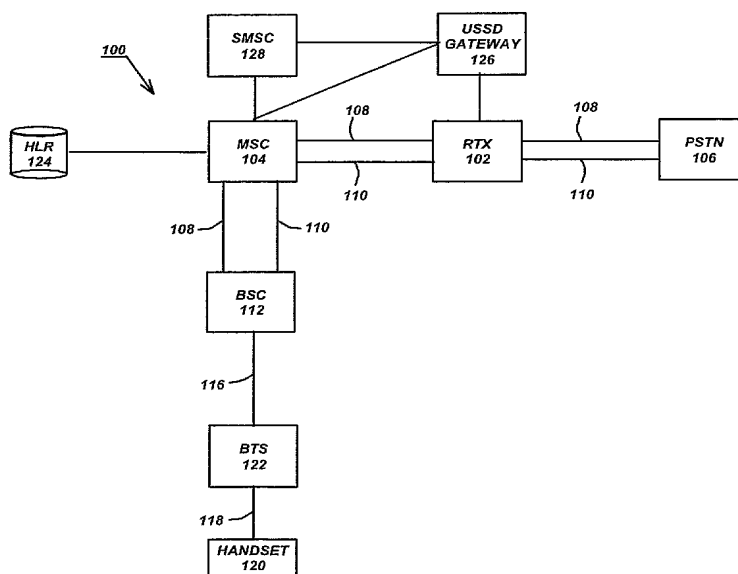
(57) **Abstract:** A system for providing advanced voice services (AVS) on legacy handsets includes a Real-Time Exchange (RTX) that interfaces to a wireless communications network to provide the AVS therein, wherein the AVS comprise Push-to-Talk, Conference Call, and Instant Voice Messaging. Both the RTX and the legacy handsets that use the AVS communicate with each other using an Unstructured Supplementary Service Data (USSD) session to provide the AVS on the handsets, wherein the USSD sessions are interactive, menu-driven sessions. The USSD sessions allow users of the legacy handsets to perform a number of AVS functions, including Group Management Services, Call Management Services, and Presence Management Services.

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TECHNIQUE FOR IMPLEMENTING ADVANCED VOICE SERVICES USING AN UNSTRUCTURED SUPPLEMENTARY SERVICE DATA (USSD) INTERFACE

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit under 35 U.S.C. Section 119(e) of the following co-pending and commonly-assigned patent application:

U.S. Provisional Application Serial Number 60/666,424, filed on March 30, 2005, by Krishnakant M. Patel, Gorachand Kundu, Sameer P. Dharangaonkar, Giridhar K. Boray, and Biswas Deepankar, entitled "TECHNIQUE FOR IMPLEMENTING ADVANCED VOICE AND GROUP MANAGEMENT SERVICES USING USSD INTERFACE," attorneys' docket number 154.19-US-P1; which application is incorporated by reference herein.

This application is a continuation-in-part and claims the benefit under 35 U.S.C. Sections 119, 120 and/or 365 of the following co-pending and commonly-assigned patent applications:

U.S. Utility Application Serial Number 10/515,556, filed November 23, 2004, by Gorachand Kundu, Ravi Ayyasamy and Krishnakant Patel, entitled "DISPATCH SERVICE ARCHITECTURE FRAMEWORK," attorney docket number G&C 154.4-US-WO, which application claims the benefit under 35 U.S.C. Section 365 of PCT International Patent Application Serial Number PCT/US03/16386 (154.4-WO-U1), which application claims the benefit under 35 U.S.C. Section 119(e) of U.S. Provisional Patent Application Serial Numbers 60/382,981 (154.3-US-P1), 60/383,179 (154.4-US-P1) and 60/407,168 (154.5-US-P1);

U.S. Utility Application Serial Number 10/564,903, filed January 17, 2006, by F. Craig Farrill, Bruce D. Lawler and Krishnakant M. Patel, entitled "PREMIUM VOICE SERVICES FOR WIRELESS COMMUNICATIONS SYSTEMS," attorney docket number G&C 154.7-US-WO, which application claims the benefit under 35 U.S.C. Section 365 of PCT International Patent Application Serial Number

PCT/US04/23038 (154.7-WO-U1), which application claims the benefit under 35 U.S.C. Section 119(e) of U.S. Provisional Patent Application Serial Numbers 60/488,638 (154.7-US-P1), 60/492,650 (154.8-US-P1) and 60/576,094 (154.14-US-P1) and which application is a continuation-in-part and claims the benefit under 35

5   U.S.C. Section 119, 120 and/or 365 of PCT International Patent Application Serial Number PCT/US03/16386 (154.4-WO-U1);

United States Patent Application Number 11/126,587, filed May 11, 2005, by Ravi Ayyasamy and Krishnakant M. Patel, entitled "ARCHITECTURE, CLIENT SPECIFICATION AND APPLICATION PROGRAMMING INTERFACE (API)

10   FOR SUPPORTING ADVANCED VOICE SERVICES (AVS) INCLUDING PUSH TO TALK ON WIRELESS MOBILE UNITS 120 AND NETWORKS," attorney docket number 154.9-US-U1, which application claims the benefit under 35 U.S.C. Section 119(e) of U.S. Provisional Patent Application Serial Numbers 60/569,953 (154.9-US-P1) and 60/579,309 (154.15-US-P1), and which application is a

15   continuation-in-part and claims the benefit under 35 U.S.C. Sections 119, 120 and/or 365 of U.S. Utility Patent Application Serial Number 10/515,556 (154.4-US-WO) and PCT International Patent Application Serial Number PCT/US04/23038 (154.7-WO-U1);

U.S. Utility Patent Application Number 11/129,268, filed May 13, 2005, by

20   Krishnakant M. Patel, Gorachand Kundu, Ravi Ayyasamy and Basem Ardah, entitled "ROAMING GATEWAY FOR SUPPORT OF ADVANCED VOICE SERVICES WHILE ROAMING IN WIRELESS COMMUNICATIONS SYSTEMS," attorney docket number 154.10-US-U1, which application claims the benefit under 35 U.S.C. Section 119(e) of U.S. Provisional Patent Application Serial Number 60/571,075

25   (154.10-US-P1), and which application is a continuation-in-part and claims the benefit under 35 U.S.C. Sections 119, 120 and/or 365 of U.S. Utility Patent Application Serial Number 10/515,556 (154.4-US-WO) and P.C.T. International Patent Application Serial Number PCT/US04/23038 (154.7-WO-U1);

U.S. Utility Patent Application Number 11/134,883, filed May 23, 2005, by Krishnakant Patel, Vyankatesh V. Shanbhag, Ravi Ayyasamy, Stephen R. Horton and Shan-Jen Chiou, entitled "ADVANCED VOICE SERVICES ARCHITECTURE FRAMEWORK," attorney docket number 154.11-US-U1, which application claims

5   the benefit under 35 U.S.C. Section 119(e) of U.S. Provisional Patent Application Serial Numbers 60/573,059 (154.11-US-P1) and 60/576,092 (154.12-US-P1), and which application is a continuation-in-part and claims the benefit under 35 U.S.C. Sections 119, 120 and/or 365 of U.S. Utility Patent Application Serial Number 10/515,556 (154.4-US-WO), P.C.T. International Patent Application Serial Number

10   PCT/US04/23038 (154.7-WO-U1), U.S. Utility Patent Application Serial Number 11/126,587 (154.9-US-U1), and U.S. Utility Patent Application Serial Number 11/129,268 (154.10-US-U1); and

U.S. Utility Patent Application Number 11/136,233, filed May 24, 2005, by Krishnakant M. Patel, Vyankatesh Vasant Shanbhag, and Anand Narayanan, entitled

15   "SUBSCRIBER INFORMATION MODULE (SIM) ENABLING ADVANCED VOICE SERVICES (AVS) INCLUDING PUSH TO TALK ON WIRELESS MOBILE UNITS 120 AND NETWORKS," attorney docket number 154.13-US-U1, which application claims the benefit under 35 U.S.C. Section 119(e) of U.S. Provisional Patent Application Serial Number 60/573,780 (154.13-US-P1), and which

20   application is a continuation-in-part and claims the benefit under 35 U.S.C. Sections 119, 120 and/or 365 of U.S. Utility Patent Application Serial Number 10/515,556 (154.4-US-WO), P.C.T. International Patent Application Serial Number PCT/US04/23038 (154.7-WO-U1), U.S. Utility Patent Application Serial Number 11/126,587 (154.9-US-U1), and U.S. Utility Patent Application Serial Number

25   11/134,883 (154.11-US-U1);

U.S. Utility Patent Application Number 11/158,527, filed June 22, 2005, by F. Craig Farrill, entitled "PRESS-TO-CONNECT FOR WIRELESS COMMUNICATIONS SYSTEMS," attorney docket number 154.16-US-U1, which application claims the benefit under 35 U.S.C. Section 119(e) of U.S. Provisional

Patent Application Serial Number 60/581,954 (154.16-US-P1), and which application

is a continuation-in-part and claims the benefit under 35 U.S.C. Sections 119, 120

and/or 365 of U.S. Utility Patent Application Serial Number 10/515,556 (154.4-US-

WO) and P.C.T. International Patent Application Serial Number PCT/US04/23038

5   (154.7-WO-U1);

        U.S. Utility Patent Application Number 11/183,516, filed July 18, 2005, by

Deepankar Biswaas, entitled "VIRTUAL PUSH TO TALK (PTT) AND PUSH TO

SHARE (PTS) FOR WIRELESS COMMUNICATIONS SYSTEMS," attorney

docket number 154.17-US-U1, which application claims the benefit under 35 U.S.C.

10   Section 119(e) of U.S. Provisional Patent Application Serial Number 60/588,464

(154.17-US-P1); and

        U.S. Utility Patent Application Number 11/356,775, filed February 17, 2006,

by Krishnakant M. Patel, Bruce D. Lawler, Giridhar K. Boray, and Brahmananda R.

Vempati, entitled "ENHANCED FEATURES IN AN ADVANCED VOICE

15   SERVICES (AVS) FRAMEWORK FOR WIRELESS COMMUNICATIONS

SYSTEMS," attorney docket number 154.18-US-U1, which application claims the

benefit under 35 U.S.C. Section 119(e) of U.S. Provisional Patent Application Serial

Number 60/654,271(154.18-US-P1);

        all of which applications are incorporated by reference herein.

20

BACKGROUND OF THE INVENTION

        1.   Field of the Invention.

        This invention relates in general to wireless communications systems, and

more specifically, to enabling Advanced Voice Services (AVS) on legacy handsets

25   using an Unstructured Supplementary Service Data (USSD) interface.

        2.   Description of Related Art.

        Group-based voice services, such as two-way half-duplex voice calls within a

group or between individuals, also known as "Push-to-Talk," "Press-to-Talk," PTT or

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P2T, have enormous revenue earnings potential for wireless networks, such as cellular networks and personal communications systems (PCS) networks.

Moreover, the Assignee has introduced Advanced Voice Services (AVS) including improved implementations for P2T, as well as novel group-based voice

5   services such as Push-to-Conference (P2C) (also known as Conference Call), Upgrade to Conference (upgrade from P2T to P2C), Push-to-Message (P2M) (also known as Instant Voice Messaging or IVM) and group SMS (Short Message Service), for wireless mobile units or handsets and networks. More information on these advanced voice services can be found in the cross-referenced applications identified above.

10   In most instances, to support the AVS, improved high-end handsets are used, where a client application can be installed on the phone or the handsets that use SIMs (Subscriber Identity Modules) with high memory availability. In one embodiment, client software is installed on each handset or SIM in order to support the AVS.

Because of this constraint, a subscriber who wants to subscribe to the AVS has

15   to replace their older handset or SIM with a newer handset or high memory SIM that supports AVS. This is an important issue for network operators who are willing to provide AVS. For this service to be popular amongst mass subscriber base, however, the service should be accessible to the subscribers on their existing legacy handsets or SIMs.

20   Consequently, there is a need in the art for support for the AVS on legacy handsets, without reprogramming the handsets or installing new software on the handsets. The present invention aims to satisfy this need.

SUMMARY OF THE INVENTION

25   To overcome the limitations in the prior art described above, and to overcome other limitations that will become apparent upon reading and understanding the present specification, the present invention discloses a system for providing advanced voice services (AVS) on legacy handsets. In this system, a Real-Time Exchange (RTX) interfaces to a wireless communications network to provide the AVS therein,

wherein the AVS comprise Push-to-Talk, Conference Call, and Instant Voice Messaging. The RTX and the legacy handsets that use the AVS communicate with each other using interactive, menu-driven sessions to provide the AVS for the legacy handsets. In one embodiment, the sessions are Unstructured Supplementary Service Data (USSD) sessions. The sessions allow users of the legacy handsets to perform the following functions: Create Group, Rename Group, View Group, Delete Group, Leave Group, and Call Group for different type of AVS calls. The sessions also allow users of the legacy handsets to perform the following functions: Add Group Members, Remove Group Members, View Group Members, and Call Group Members. In addition, the sessions allow users of the legacy handsets to perform the following functions: Set Self Status, Get Group Status, Get Group Member Status and Set Phone Properties.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings in which like reference numbers represent corresponding parts throughout:

FIG. 1 is a block diagram that illustrates an exemplary embodiment of a wireless communications network according to a preferred embodiment of the present invention;

FIG. 2 illustrates a proposed architecture for a real-time exchange according to the preferred embodiment of the present invention; and

FIG. 3 is a flowchart that illustrates the user service interaction and use cases for group, presence and call management on the real-time exchange using a Unstructured Supplementary Service Data (USSD) session, according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In the following description of the preferred embodiment, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way

of illustration the specific embodiment in which the invention may be practiced. It is to be understood that other embodiments may be utilized as structural changes may be made without departing from the scope of the present invention.

5   Overview

The present invention uses Unstructured Supplementary Service Data (USSD) as an enabler to provide the AVS on legacy handsets. USSD is a feature available only in GSM networks today, although it may be provided in other networks at a later date, or other networks may use a similar protocol. With USSD support, subscribers

10   have the opportunity to immediately experience the benefits of the AVS without the cost or inconvenience of handset replacement.

USSD is a session-oriented protocol suited for interactive, menu-driven sessions. In operation, USSD is used to send text between the handset and a USSD application located somewhere in the network. USSD, unlike the store and forward

15   nature of SMS (Small Message Services), is session-oriented. When a user accesses a USSD application, an end-to-end session is established that remains open over the radio connection until the user terminates the application. This facilitates real-time interactive communication. The primary benefit of USSD is that it allows for very fast communication between the user and an application.

20   The key features that make USSD attractive as a message bearer are ease of subscriber use, interactive communication and speed of messaging. USSD is a faster and better way for interactive transactions and call-related messaging as compared to SMS.

25   Network Architecture

FIG. 1 is a block diagram that illustrates an exemplary embodiment of a wireless communications network according to a preferred embodiment of the present invention.

Within the network 100, an RTX (Real-Time Exchange) 102, previously known as a Dispatch Gateway (DG), communicates with a MSC (Mobile Switching Center) 104 and PSTN (Public Switched Telephone Network) 106 using SS7 - ISUP/WIN/CAMEL/MAP (Signaling System 7 - Integrated Services Digital Network
5   User Part/Wireless Intelligent Network/Customized Applications for Mobile Enhanced Logic/Mobile Application Part) messages at a signaling plane 108. A bearer path 110 implements a TDM (Time Division Multiplexing) interface carrying PCM (Pulse Code Modulation) or TFO (Tandem Free Operation) voice frames.

When an AVS subscriber originates an AVS call, the MSC 104 routes the call
10   to the RTX 102. The MSC 104 also requests the BSC 112 via 116 to establish a radio traffic path 118 with a handset or mobile unit 120 via the BTS (Base Transceiver Station) 122 (as it does for a normal cellular call). At this time, the BSC 112 tries to negotiate TFO (if it is supported) or PCM on a TDM link with the far end (in this case, the RTX 102).

15   At the same time (after the MSC 104 terminates the AVS call request to the RTX 102), the RTX 102 identifies the terminating users and their MS-ISDN (Mobile Station - Integrated Services Digital Network) numbers (also known as Mobile Directory Numbers or MDNs). It sends an ISUP call origination request for each terminating mobile unit 120. It may send requests directly to the MSC 104, PSTN 106
20   or other terminating network, depending on the routing table configuration for terminating MS-ISDN numbers. Once the bearer path 110 is established, the RTX 102 begins a negotiation with the far end (e.g., the terminating BSC 112) for each terminating leg to a mobile unit 120.

Once bearer paths 110 are established for originating and terminating legs for
25   an AVS call, the RTX 102 switches (or duplicates) voice frames between the originating mobile units 120 and terminating mobile units 120.

During roaming, a Home Location Register (HLR) 124 can be accessed via the MSC 104. The HLR 124 can be used to track the presence of mobile units 120

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within the network 100 and update the network 100 with the availability of the mobile units 120.

In a preferred embodiment of the present invention, a USSD Gateway 126 acts as a redirector for users to access a USSD application performed by the RTX 102,

5   wherein the USSD application provides the AVS functionality for mobile units 120 that are not enabled for the AVS, such as legacy mobile units 120. In this manner, the RTX 102 can provide the various AVS functionality to any mobile unit 120, including:

1.   Group Management Services,

10   2.   Call Management Services, and

3.   Presence Management Services.

The operation of the RTX 102 in providing the various AVS functionality is described in more detail below.

15   <u>Real Time Exchange</u>

FIG. 2 illustrates a proposed architecture for the RTX 102 according to the preferred embodiment of the present invention.

The architecture includes a Call Processing system 200, Presence Server 202, Real-Time Event Processing system 204, one or more Media Managers 206, and an

20   SMPP (Short Message Peer-to-Peer) Transport 208, as well as modules for various SS7 protocols, such as MTP-1 (Message Transfer Part Level 1) 210, MTP-2 (Message Transfer Part Level 2) 212, MTP-3 (Message Transfer Part Level 3) 214, ISUP (Integrated Services Digital Network User Part) 216, SCCP (Signaling Connection Control Part) 218, and TCAP (Transactions Capabilities Application Part) 220

25   protocols.

The Call Processing system 200, Presence Server 202, Media Managers 204, SMPP Transport 206, and other modules communicate across an IP network 222. The Real-Time Event Processing system 204 communicates directly with the Call Processing system 200, Presence Server 202, and the modules for various SS7

protocols. The modules for various SS7 protocols communicate with other entities via a SS7 Signaling Link 224. The SMPP Transport 206 communicates with a SMSC (Short Message Service Center) 128 using the SMPP protocol 226. The Media Managers 204 communicate among themselves using the H.110 protocol 228 (or

5   some other protocol, such TCP/IP).

The operation of these various components are described in more detail below, as well as in the co-pending and commonly-assigned patent applications cross-referenced above and incorporated by reference herein.

The originating mobile unit 120 signals the RTX 102 via the wireless network

10   100, e.g., by transmitting one or more configured DTMF (Dual Tone Multi Frequency) digits to the RTX 102. The Media Manager systems 206 receive the DTMF digits and pass the DTMF digits to the Call Processing system 200. The Call Processing (CP) system 200 determines whether the originating mobile unit 120 has subscribed to the AVS feature before originating the AVS call. Upon confirmation,

15   the Call Processing system 200 initiates a new AVS call. The Call Processing system 200 interacts with the Presence Server 202 and Real-Time Event Processing system 204 to cause the wireless network 100 to perform call setup with the terminating mobile units 120 for the AVS call, and thereafter to manage the AVS call.

During the AVS call, the Call Processing system 200 interacts with the Media

20   Manager systems 206 to maintain the H.110 channels 228 and assign any additional H.110 channels 228 required for the AVS call, which may span across multiple Media Manager systems 206. During the AVS call, the Media Manager systems 206 of the RTX 102 are used to mix audio streams between the originating mobile units 120 and the terminating mobile units 120, and then deliver these mixed audio streams to the

25   originating mobile units 120 and the terminating mobile units 120. The H.110 channels 228 are used for passing mixed and unmixed audio streams voice between the Media Manager systems 200 as required.

The RTX 102 also includes a USSD adapter module 230 to process USSD/MAP (Mobile Application Part) requests received from the USSD Gateway

126. The USSD adapter module 230 interacts with the Call Processing system 200 to initiate AVS calls on the RTX 102. The USSD adapter module 230 also interacts with the Presence Server 202 to create, delete and/or rename groups and contacts stored on the RTX 102.

Service Interaction and Use Cases

FIG. 3 is a flowchart that illustrates the user service interaction and use cases for group, presence and call management on the RTX 102 using a USSD session, according to a preferred embodiment of the present invention. Preferably, this functionality is provided by the Call Processing system 200 of the RTX 102 using the USSD adapter module 230 to interface to the USSD Gateway 126.

Note that the keys and functionality used in the following use cases may differ for different types of mobile units 120. The examples described herein are not limited to the specific keys and functionality described.

Block 300 represents the user dialing a USSD number or code published by the operator for the AVS, such as *123#, on the mobile unit 120, and then presses the «Call» button (depending on the model of the mobile unit 120), in order to access the AVS. Block 302 represents the mobile unit 120 initiating a USSD session via the MSC 104, wherein the MSC 104 connects through to the HLR 124 (302).

Preferably, the user input is always routed back to the HLR 124 in the home network 100, so that the AVS can be provided seamlessly in the same way when the user is roaming. Block 304 represents the HLR 124 routing the user input to the USSD Gateway 126. However, routing the user input through the HLR 124 is not a requirement and the user input could be routed directly from the MSC 104 to the USSD Gateway 126.

Block 306 represents the USSD Gateway 126 interpreting the USSD number or code as a specific request for interaction with a defined application, in this case, the AVS provided by the RTX 102, and initiating a session with the RTX 102 and submitting the USSD number or code to the RTX 102.

Block 308 represents the RTX 102 receiving the USSD number or code and initiating a session for the mobile unit 120 (308). For the duration of this session, the RTX 102 receives the user input from the mobile unit 120, processes the user input, and (optionally) sends an appropriate response to the mobile unit 120. The RTX 102 responds back to the mobile unit 120 through the USSD Gateway 126 within the same session.

The specifics of the interactions between the mobile unit 120 and RTX 102 are described in each of sections set forth below. Blocks 310 through 318 represent these interactions, wherein Block 310 represents the RTX 102 receiving the user input from the mobile unit 120, Block 312 represents the RTX 102 processing the user input, and Block 314 represents the RTX 102 generating an optional response that is sent back to the mobile unit 120.

Block 316 is a decision block that represents the RTX 102 determining whether the session should end. If not, then control transfers back to Block 310 to wait for further user input from the mobile unit 120; otherwise, control transfers to Block 318 to end the session.

Service Usage Overview

In this section, Blocks 310 through 318 represent the service usage overview.

In response to receiving the USSD number or code from the mobile unit 120, the RTX 102 initially sends a main menu for the AVS to the mobile unit 120 for display. For example, the main menu may comprise:

    1.   Create Group

    2.   View Group

    3.   Delete Group

    4.   Leave Group

    5.   Call Group

    6.   Set Self Status

    7.   Set Phone Type

The user can select an operation from main menu by pressing «Answer», pressing the key for the number of the chosen operation, and pressing «Send/OK» (depending on the mobile unit 120). (In these examples, the characters « and » are delimiters that indicate the user input and do not comprise user input themselves.)

5   For example, if the user wants to select "View Group" above, the user presses «Answer», presses «2», and presses «Send/OK». This user input is then transmitted to the RTX 102.

In response, the RTX 102 sends the mobile unit 120 a list of all the groups created by the user and groups in which the user is a member. For example, the list

10   may comprise:

1.   Design

2.   Family

3.   Kodiak

4.   Sales

15   The user can select a group from the list. For example, to select the group "Design" above, the user presses «Answer», presses «1», and presses «Send/OK». This user input is then transmitted to the RTX 102.

In response, the RTX 102 sends the mobile unit 120 a list of menu operations that can be performed on the group. For example, the menu operations may comprise:

20   1.   Call Group

2.   Add Members

3.   Remove Members

4.   View Members

5.   Rename Group

25   The user can then select desired the operation from the menu. For example, to select the "View Members" operation above, the user presses «Answer», presses «4», and presses «Send/OK». This user input is then transmitted to the RTX 102.

In response, the RTX 102 sends the mobile unit 120 detailed information on the members of the group. For example, the detailed information may comprise:

1.   Joe (310) 555-1212 (1)

2.   Karen (310) 555-1213 (1)

3.   Jack (310) 555-1214 (0)

In this example, the detailed information includes the group member's name, phone number, and availability (in parentheses) where 1 indicates Available and 0 indicates Not Available.

Note that the subscriber can bookmark an operation in the address book of the mobile unit 120, by programming, in series, the user input required to perform a desired operation. For example, for viewing the list of the user groups, the following bookmark may be created: «*123*2#».

Create Group

In this section, Blocks 310 through 318 represent the use case to create a group for the AVS on the RTX 102 using a USSD session.

1.   The user has already initiated the USSD session by following the steps described above in "Service Usage Overview."

2.   The user wants to create new group. The user presses the «Answer» key on the main menu. The mobile unit 120 provides a blank screen to type the input.

3.   The user enters option 1 and presses the «Send» key.

4.   The RTX 102 responds to the user and requests the user to enter the group name.

5.   The user enters the group name "Kodiak" and sends the request to the RTX 102 by pressing the «Send» key.

6.   The RTX 102 responds with the instruction to enter a group member's MDN. The user can enter multiple MDNs separated by *.

7.   The user selects the «Answer» key and enters all group members' MDNs on the blank screen separated by *. The user completes the request by pressing the «Send» key.

15

8.   The RTX 102 responds to the request and terminates the USSD session with the MS.

9.   The user terminates the session by pressing the «Exit» key (also known as the «End» key).

10.   The RTX 102 validates all group members MDNs and creates a new group.

11.   The RTX 102 names the group and sends an SMS message back to the user with the group details. This SMS message instructs the user to save the "Group Number" in the address book of the mobile unit 120 to call this group. Three MDNs are generated for every group, for Push-to-Talk, Conference and Instant Voice Message calls.

Note that, if the user has set the phone type and make (as described below), then the RTX 102 will try pushing a VCard onto the mobile unit 120. This VCard will have the call type (Push-to-Talk or PTT, Conference Call or Conf, and Instant Voice Messaging or IVM) and the name of the group, e.g., "Conf-Kodiak," as well as the MDN associated with the call type. The RTX 102 generates three different VCards and pushes them to all group members' mobile units 120 for the three different call types.

Delete Group

In this section, Blocks 310 through 318 represent the use case to delete a group on the RTX 102 using a USSD session.

1.   The user has already initiated the USSD session by following the steps described above in "Service Usage Overview."

2.   The user wants to delete an existing group. The user presses the «Answer» key on the main menu. The mobile unit 120 provides a blank screen to type the input.

3.   The user enters option 3 and presses the «Send» key.

4.   The RTX 102 responds with the group list owned by the user (the user is allowed to delete only those groups which have been created by the user).

5.   The user selects the «Answer» key and enters the sequence id for the group to delete (e.g., for the "Family" group, the sequence is 1). The user completes the request by pressing the «Send» button.

6.   The RTX 102 processes the user request and deletes the requested group. The RTX 102 sends a "success" response and terminates the USSD session with the mobile unit 120.

7.   The user terminates the session by pressing the «Exit» key.

Leave Group

In this section, Blocks 310 through 318 represent the use case to leave a group on the RTX 102 using a USSD session. Note that the user can leave only those groups of which he is not the owner (i.e., the group was not created by the user).

1.   The user above was already initiated the USSD session by following the steps described above in "Service Usage Overview."

2.   The user wants to leave a group of which he is a member. The user presses the «Answer» key on the main menu. The mobile unit 120 provides a blank screen to type the input.

3.   The user enters option 4 and presses the «Send» key.

4.   The RTX 102 responds with the list of groups of which user is a member (the user is allowed to leave only those groups which are not created by him).

5.   The user selects the «Answer» key and enters the sequence id for the group to leave (e.g., for the group "Design," the sequence is 2). The user completes the request by pressing the «Send» button.

6.   The RTX 102 processes the user request and deletes the user record from that group. The RTX 102 sends a "success" response and terminates the USSD session with the mobile unit 120.

7.   The user terminates the session by pressing the «Exit» key.

<u>View Group</u>

In this section, Blocks 310 through 318 represent the use case to view a group
on the RTX 102 using a USSD session. Note that the user can view only those groups
5   of which he is a member.

1.   The user has already initiated the USSD session by following the steps
described above in "Service Usage Overview."

2.   The user wants to view the groups. The user presses the «Answer» key
on the main menu. The mobile unit 120 provides a blank screen to type the user input
10 as shown in the diagram.

3.   The user enters option 2 and presses the «Send» key.

4.   The RTX 102 responds with a list of all the groups that have been
created by the user and also groups in which the user is a member. The RTX 102 also
indicates the total number of group members in the group and group members
15 currently available to accept the call.

5.   To select the specific group, the user selects the «Answer» key and
enters the sequence number for the group to check (e.g., for the group "Design," the
sequence is 1). The user completes the request by pressing the «Send» button.

6.   The RTX 102 processes the user request and responds with another
20 menu listing all the operations the user can perform on the selected group. For
example, the menu operations may comprise:

1.   Call Group

2.   Add Members

3.   Remove Members

25 4.   View Members

5.   Rename Group

However, the menu operations are dynamic and depend on the group selected. For
example, if the selected group is created and owned by the user, then the RTX 102
provides the option to add and remove members from the group. On the other hand, if

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the group is not owned by the user, then these options may not be available, although the leave group option may be provided (from the main menu).

7.   These various menu options are described in more detail below.

Add Group Members

In this section, Blocks 310 through 318 represent the use case to add group members in existing groups on the RTX 102 using a USSD session.

1.   The user has already reached the group menu by following the steps described above in "View Group."

2.   The user wants to add group members. The user presses the «Answer» key on the group menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 2 and presses the «Send» key.

4.   The RTX 102 responds with the instruction to add the group member's MDN. The user can enter multiple MDNs separated by a *.

5.   The user selects the «Answer» key and enters all group members MDNs on the blank screen separated by *. The user completes the request by pressing the «Send» key.

6.   The RTX 102 processes the user request and adds the requested group members. The RTX 102 sends a "success" response and terminates the USSD session with the mobile unit 120.

7.   The user terminates the session by pressing the «Exit» key.

8.   The RTX 102 validates all group members' MDNs and sends an SMS message back to the user with all the group members' details added in the group.

Remove Group Members

In this section, Blocks 310 through 318 represent the use case to remove group members from existing groups on the RTX 102 using a USSD session.

1.   The user has already reached the group menu by following the steps described above in "View Group."

2.   The user wants to remove group members from the group. The user presses the «Answer» key on the group menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 3 and presses the «Send» key.

4.   The RTX 102 responds with the instruction to enter the group member's MDN which the user wants to remove. The user can enter multiple MDNs or a group member index listed on the screen, separated by a *.

5.   The user selects the «Answer» key and enters all group members' MDNs or indexes on the blank screen separated by a *. The user completes the request by pressing the «Send» key.

6.   The RTX 102 processes the user request and removes the requested group members. The RTX 102 sends a "success" response and terminates the USSD session with the mobile unit 120.

7.   The user terminates the session by pressing the «Exit» key.

8.   The RTX 102 checks all group members' MDNs and sends an SMS message back to the user with all the group members details removed from the group.

View Group Members

In this section, Blocks 310 through 318 represent the use case to view group members in existing groups on the RTX 102 using a USSD session.

1.   The user has already reached the group menu by following the steps described above in "View Group."

2.   The user wants to view group members in the group. The user presses the «Answer» key on the group menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 4 and presses the «Send» key.

4.   The RTX 102 responds with a list of all group members. The RTX 102 also indicates the group member's availability status for each member.

Rename Group

5   In this section, Blocks 310 through 318 represent the use case to rename an existing group on the RTX 102 using a USSD session.

1.   The user has already reached the group menu by following the steps described above in "View Group."

2.   The user wants to rename the group. The user presses the «Answer» 10   key on the group menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 5 and presses the «Send» key.

4.   The RTX 102 responds with the instruction to enter the new group name.

15   5.   The user selects the «Answer» key and enters the new group name on the blank screen. The user completes the request by pressing «Send» key.

6.   The RTX 102 renames the group in accordance with the request and terminates the USSD session with the mobile unit 120.

7.   The user terminates the session by pressing the «Exit» key.

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Invitation to Group Members

In this section, Blocks 310 through 318 represent the use case to invite group members to join the group on the RTX 102 using a USSD session.

1.   When a user is added in the group or contact, an SMS invitation is sent 25   to all the added group members.

2.   The user has to accept the invitation by responding to the invitation as per the SMS invitation.

3.   The user will be in the pending invitation state for some pre-configured time period. If the user does not accept the invitation within this time period, then the user is deleted from the group member list.

5   Call Group

In this section, Blocks 310 through 318 represent the use case to call a group created on the RTX 102 using a USSD session.

1.   The user has already initiated the USSD session by following the steps described above in "Service Usage Overview."

10   2.   The user wants to call a group. The user presses the «Answer» key on the main menu. The mobile unit 120 provides the blank screen to type the user input.

3.   The user enters option 5 and presses the «Send» key.

4.   The RTX 102 responds with a list of all groups that were created by the user and also all groups in which the user is a member. The RTX 102 also

15   indicates the total number of group members in the group and group members currently available to accept the call.

5.   The user selects the «Answer» key and enters a sequence number of the group to call. The user completes the request by pressing the «Send» key.

6.   The RTX 102 responds with the call type menu (1 - Push-to-Talk, 2 -

20   Conference Call, and 3 - Instant Voice Messaging).

7.   The user selects the «Answer» key, enters the call type number, and presses the «Send» button.

8.   The RTX 102 responds to the request and terminates the USSD session with the mobile unit 120.

25   9.   The user terminates the session by pressing the «Exit» key.

10.   The RTX 102 initiates the call with all members of the group depending on the call type selected by the user. The specifics of how the RTX 102 initiates a call with all members of the group, depending on the call type selected by the user, can be found in the cross-referenced applications set forth above.

Call Group Member

In this section, Blocks 310 through 318 represent the use case to call group members from the groups created on the RTX 102 using a USSD session.

5   1.   The user has already reached the View Members menu by following the steps described above in "View Group Members."

        2.   The user wants to call a group member in the group. The user presses the «Answer» key, enters the sequence number of the group member on a blank screen and presses the «Send» key.

10   3.   The RTX 102 responds with the call type menu (1 - Push-to-Talk, 2 - Conference Call, and 3 - Instant Voice Messaging).

        4.   The user selects the «Answer» key, enters the call type for the call, and presses the «Send» key.

        5.   The RTX 102 responds to the request and terminates the USSD session

15   with the mobile unit 120.

        6.   The user terminates the session by pressing the «Exit» key.

        7.   The RTX 102 initiates the call with the originator and terminating member depending on the call type selected by the user. The specifics of how the RTX 102 initiates the call, depending on the call type selected by the user, can be

20   found in the cross-referenced applications set forth above.

Set Self Status

The following section describes the use case to set self-status on the RTX 102 using a USSD session.

25   1.   The user has already initiated the USSD session by following the steps described above in "Service Usage Overview."

        2.   The user wants to set his presence status. The user presses the «Answer» key on the main menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 6 and presses the «Send» key.

4.   The RTX 102 responds with the menu option with different availability states. This menu also indicates the current status of the presence status of the user (marked with a (Current) indication).

5.   The user selects the «Answer» key and enters the sequence number for the state he wants to set. This state will be published to the other users who have added this user to their contact and group list. The user completes the request by pressing the «Send» key.

6.   The RTX 102 responds to the request and terminates the USSD session with the mobile unit 120.

7.   The user terminates the session by pressing the «Exit» key.

Get Group Status

The following section describes the use case to get group status on the RTX 102 using a USSD session.

1.   The user has already initiated the USSD session by following the steps described above in "Service Usage Overview."

2.   The user wants to check the group status. The user presses the «Answer» key on the main menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 2 and presses the «Send» key.

4.   The RTX 102 responds with a list of all groups which were created by the user and also all groups in which the user is a member. The RTX 102 also indicates the total number of group members in the group and group members currently available to accept the call.

Get Group Member Status

The following section describes the use case to get group member status on the RTX 102 using a USSD session.

1.   The user has already reached the group menu by following the steps described above in "View Group."

2.   The user wants to view group members in the group. The user presses the «Answer» key on the group menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 4 and presses the «Send» key.

4.   The RTX 102 responds with a list of all group members. The RTX 102 also indicates the group member's availability status for each member.

Set Phone Properties

The following section describes the use case to set the phone properties and make on the RTX 102 using a USSD session.

Note that when a user connects to the RTX 102 for the first time, this menu will be prompted to the user by the RTX 102. The RTX 102 will store this information and use the same to send different VCard formats depending on the phone type and make of the user. If the user changes the mobile unit 120, then the user has to change this using the provided menu option. This is required as the VCard format is not standard across the mobile units 120.

If the user has not set the phone type or if the phone type is not supported by the RTX 102, then the RTX 102 will send an SMS message (with the group details) to the user instead of a VCard. The user has to manually store this information in the address book of the mobile unit 120.

1.   The user has already initiated the USSD session by following the steps described above in "Service Usage Overview."

2.   The user has changed the mobile unit 120 and wants to set the new phone type in the RTX 102. The user presses the «Answer» key on the main menu. The mobile unit 120 provides a blank screen to type the user input.

3.   The user enters option 7 and presses the «Send» key.

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4.   The RTX 102 sends the complete list of manufacturers supported by the RTX 102.

5.   The user selects the correct manufacturer and sends the request to the RTX 102 by pressing the «Send» key.

6.   The RTX 102 responds with a list of versions from that manufacturer.

7.   The user selects the «Answer» key and enters the sequence number for that version on the blank screen. The user completes the request by pressing the «Send» key.

8.   The RTX 102 responds to the request and terminates the USSD session with the mobile unit 120.

9.   The user terminates the session by pressing the «Exit» key

Direct Call Dialing

As noted above, after creating or modifying a group, the RTX 102 attempts to push a VCard to all the group members, including the creator of the group, with the MDN used to call the group. For each group, the RTX 102 sends three different VCards, one for each type of call (Push-to-Talk, Conference Call, and Instant Voice Messaging).

Using the VCard, the mobile unit 120 may perform direct call dialing for the AVS. Direct call dialing does not require the mobile unit 120 to set up any USSD session; instead, the direct call is set up like a normal AVS call. The specifics of how the RTX 102 initiates an AVS call with all members of the group, depending on the call type selected by the user, can be found in the cross-referenced applications set forth above.

Conclusion

The foregoing description of the preferred embodiment of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Many modifications

and variations are possible in light of the above teaching. It is intended that the scope of the invention be limited not with this detailed description, but rather by the claims appended hereto.

WHAT IS CLAIMED IS:

1.   An apparatus for providing advanced voice services in a wireless network, comprising:

a wireless communications network for making calls to and from mobile units, wherein the calls are initiated by call setup and in-band signaling within the wireless communications network and voice frames for the calls are switched between the mobile units across bearer paths in the wireless communications network; and

a real-time exchange that interfaces to the wireless communications network to provide the advanced voice services therein, wherein the advanced voice services comprise Push-to-Talk , Conference Call, and Instant Voice Messaging;

wherein both the real-time exchange and the mobile units that use the advanced voice services communicate with each other using interactive, menu-driven sessions to provide the advanced voice services for the mobile units.

2.   The apparatus of claim 1, wherein the mobile units comprise legacy mobile units that have not been programmed to support the advanced voice services.

3.   The apparatus of claim 1, wherein the sessions are Unstructured Supplementary Service Data (USSD) sessions.

4.   The apparatus of claim 1, wherein the sessions allow users of the mobile units to perform the following functions: Create Group, Rename Group, View Group, Delete Group, Leave Group, and Call Group.

5.   The apparatus of claim 1, wherein the sessions allow users of the mobile units to perform the following functions: Add Group Members, Remove Group Members, View Group Members, and Call Group Member.

6.   The apparatus of claim 1, wherein the sessions allow users of the mobile units to perform the following functions: Set Self Status, Get Group Status, Get Group Member Status and Set Phone Properties.

7.   A method of providing advanced voice services in a wireless network, comprising:

communicating with a wireless communications network to make calls to and from mobile units, wherein the calls are initiated by call setup and in-band signaling within the wireless communications network and voice frames for the calls are switched between the mobile units across bearer paths in the wireless communications network; and

interfacing a real-time exchange to the wireless communications network to provide the advanced voice services therein, wherein the advanced voice services comprise Push-to-Talk, Conference Calls, and instant Voice Messaging;

wherein both the real-time exchange and the mobile units that use the advanced voice services communicate with each other using interactive, menu-driven sessions to provide the advanced voice services for the mobile units.

8.   The method of claim 7, wherein the mobile units comprise legacy mobile units that have not been programmed to support the advanced voice services.

9.   The method of claim 7, wherein the sessions are Unstructured Supplementary Service Data (USSD) sessions.

10.   The method of claim 7, wherein the sessions allow users of the mobile units to perform the following functions: Create Group, Rename Group, View Group, Delete Group, Leave Group, and Call Group.

11.   The method of claim 7, wherein the sessions allow users of the mobile units to perform the following functions: Add Group Members, Remove Group Members, View Group Members, and Call Group Member.

12.   The method of claim 7, wherein the sessions allow users of the mobile units to perform the following functions: Set Self Status, Get Group Status, Get Group Member Status and Set Phone Properties.
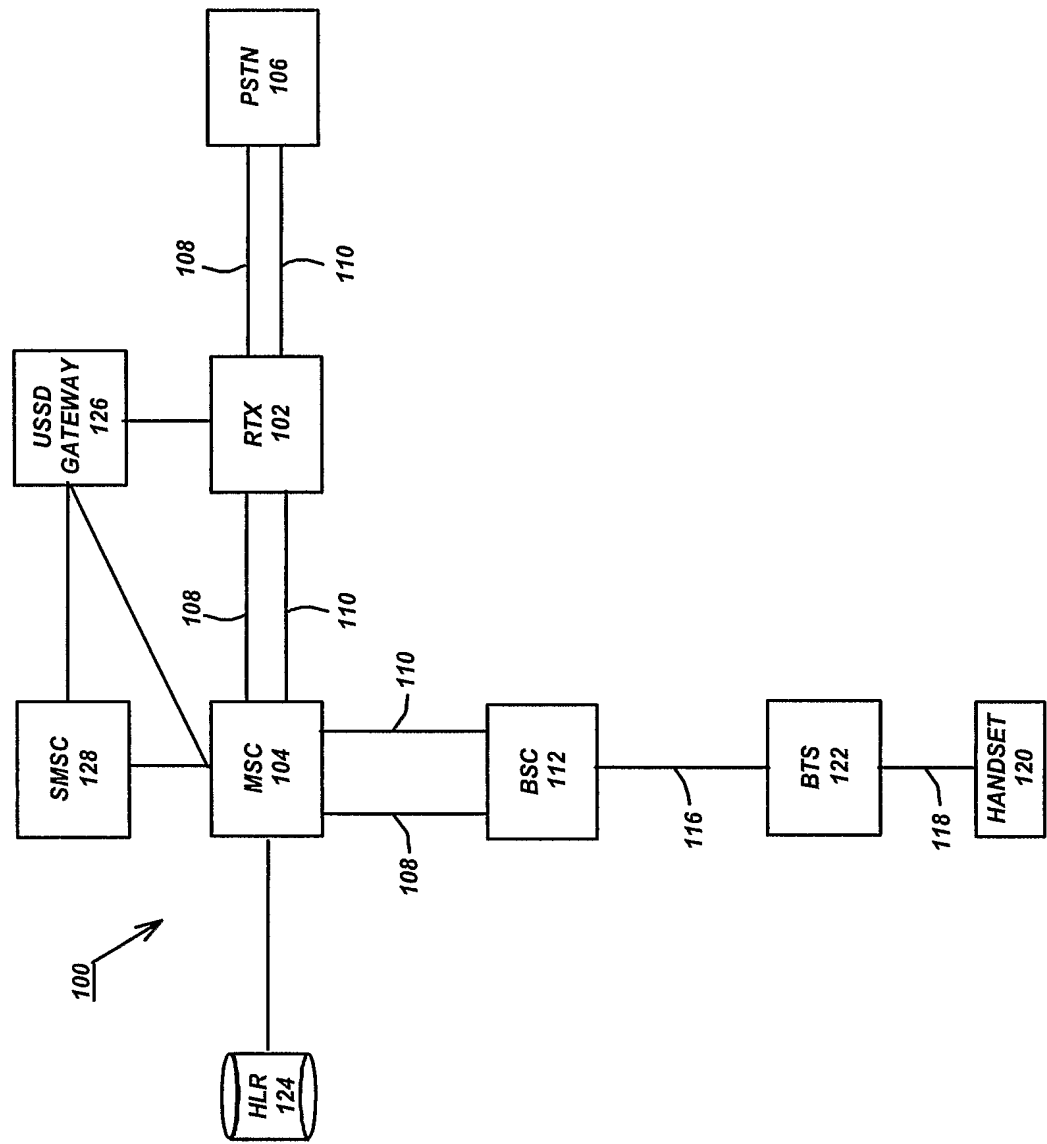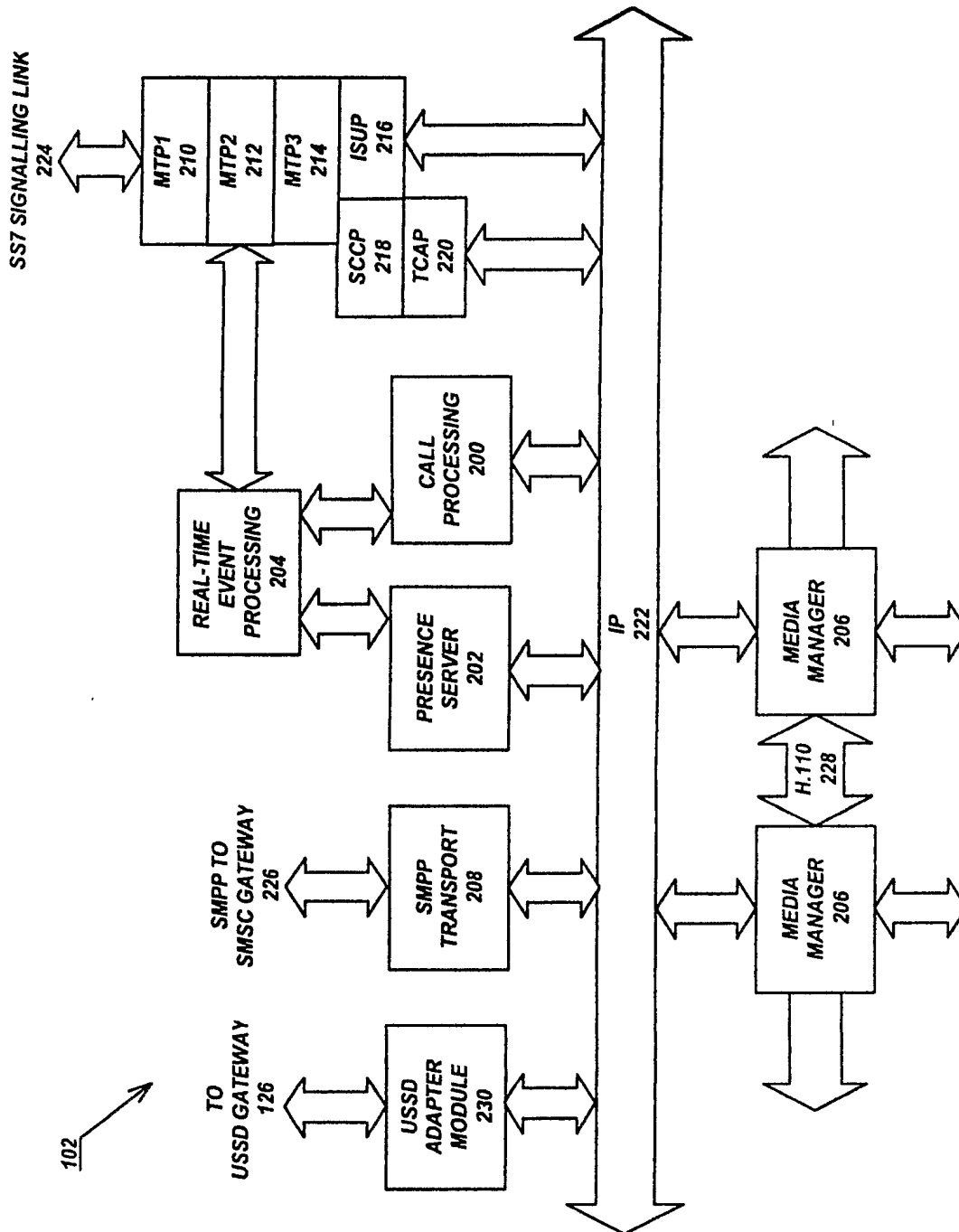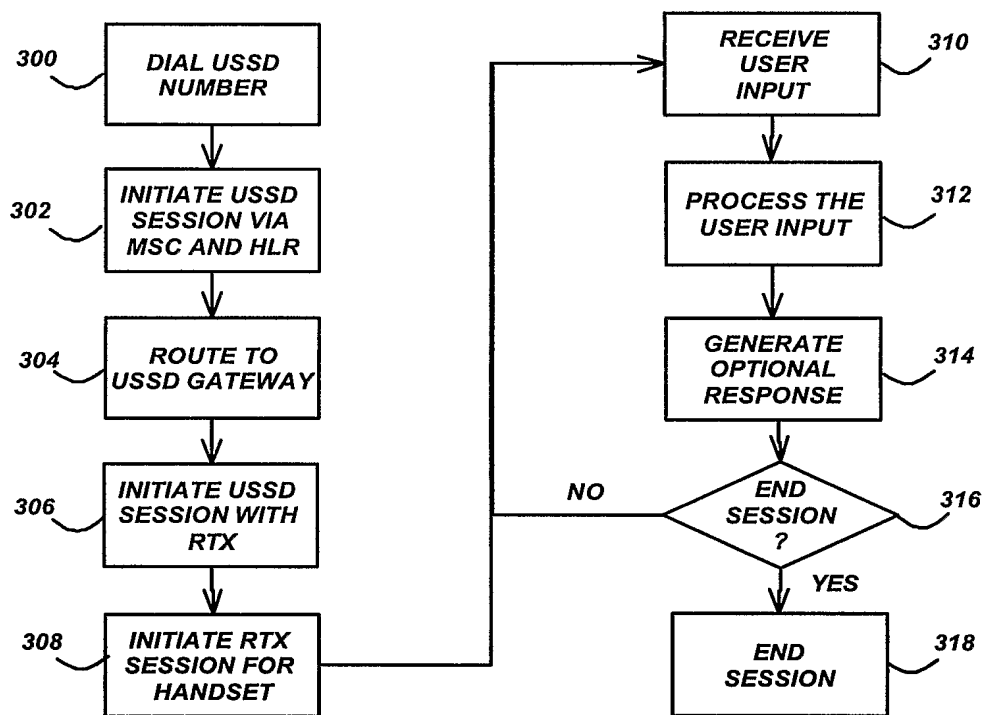
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FIG. 1

FIG. 2

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FIG. 3